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10/720,457

11/24/2003

Cha Deok Dong

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06/08/2005

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EXAMINER

TRINH, MICHAEL MANH

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 06/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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|------------------------------|--------------------------------------|---------------------------------------|--|
| Office Action Summary | Application No. 10/720,457 | Applicant(s) DONG, CHA DEOK | |
| | Examiner Michael Trinh | Art Unit 2822 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

*** This office action is in response to filing of the application on November 24, 2003.

Claims 1-5 are pending.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claims 1 and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Wu (2002/0115270).

Wu teaches a method for forming a device isolation film in a semiconductor device, comprising the steps of: performing an ion implantation 102 for controlling a threshold voltage on a surface of a semiconductor substrate 100 (Fig 3A, paragraph 0014); forming a trench to define an active region and a device isolation region by performing a photolithography process on the semiconductor substrate (Figs 3B-3C; paragraph 0016); performing an oxidation process for extremely prohibiting ions, which are implanted to control the threshold voltage, from diffusing to the device isolation region and forming a side wall oxidation film 105 at the side wall of the trench (Fig 3D; paragraph 0016); performing an ion implantation 102b on the active region to compensate for ions for controlling the threshold voltage, which are diffused from the active region to the side wall oxidation film by the oxidation process (Fig 3D; paragraph 0016); and forming a device isolation film 106 by burying the oxidation film inside the trench (Figs 3E-3F, paragraph 0017; Figs 4A-4F, paragraphs 0020-0021). Re claim 5, wherein boron is used as an ion for implanting to control the threshold voltage (paragraph 0014).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

4. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wu (2002/0115270) taken with Oda et al (2002/0086498).

Wu teaches a method for forming a device isolation film in a semiconductor device, as applied to claim 1 above.

Re claim 2, Wu already teaches performing an oxidation to form the sidewall oxidation film 105 having a thickness in a range of 50 to 150 Angstroms. Wu does not mention the oxidation to round an upper portion or bottom corner of the trench.

However, Oda et al teach (at Figs 2, paragraph 0045; Figs 3-9; paragraphs 0046-0052) when forming the trench, the side wall oxidation film 5 formed by oxidation to perform a rounding treatment to round on an upper corner portion of the trench, and to suppress fluctuation of a threshold voltage in an upper corner portion of the trench isolation (paragraphs 0017-0021), wherein bottom corners of the trench is inherently rounded during the same oxidation step, and wherein an adhesive strength of the oxidation film to be buried inside the trench is also inherently increased due to the formation of the sidewall oxidation film.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the device isolation film in a semiconductor device of Wu by rounding the upper portion or corners of the trench at the same time during the oxidation step to the sidewall

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oxidation film as taught by Oda. This is at least because of the desirability to suppress fluctuation of a threshold voltage in an upper corner portion of the trench isolation. Also, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of thickness in a range of 50 to 150 Angstroms, as disclosed by Wu, which is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

5. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wu (2002/0115270) taken with Hong (6,030,882).

Wu teaches a method for forming a device isolation film in a semiconductor device, as applied to claim 1 above.

Re claim 3, Wu already teaches performing an oxidation to form the sidewall oxidation film, but lacks mentioning by a dry oxidation at a temperature of 800-900°C.

However, Hong teaches (at Figs 2C-2D; col 4, lines 13-25) forming a sidewall oxidation film 218 on sidewalls of the trench by dry oxidation at a temperature of about 900°C.

Therefore, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of temperature of about 900°C in the dry oxidation to form the sidewall oxidation film on sidewalls of the trench, as disclosed by Hong, which temperature is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, , and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation", *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934); wherein the dry oxidation is

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effectively process for forming a thin uniform sidewall oxidation film on the sidewalls of the trench as a liner oxide layer.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wu (2002/0115270) taken with Oda et al (2002/0086498).

Wu teaches a method for forming a device isolation film in a semiconductor device, as applied to claim 1 above.

Re claims 4-5, Wu already teaches performing an ion implantation process on an active region after the oxidation process, but lack mentioning the implantation at a dose of $1E11$ to $1E12$ ion/cm² in an energy band of 10 Kev to 25 Kev.

However, Oda teaches performing an ion implantation process on an active region after the oxidation process, wherein the implantation is performed at a dose of $5E11$ to $1E14$ ion/cm² in an energy band of 10 Kev to 30 Kev.

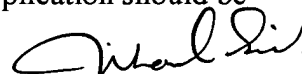
Therefore, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to perform the ion implantation of Wu by selecting the portion of the prior art's range of dose and energy, as disclosed by Oda, which is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (571) 272-1847. The examiner can normally be reached on M-F: 8:30 Am to 5:00 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application should be directed to the receptionist whose telephone number is (703) 308-0956.

Oacs-15


Michael Trinh
Primary Examiner